# Savitribai Phule Pune University

Khadki Education Society's

# Tikaram Jagannath Arts, Commerce and Science College
# Khadki, Pune-03

**(Autonomous)**

## Four Year Bachelors Degree Program in Computer Science

Faculty of Science and Technology

**Syllabi For**

# B.Sc. (Computer Science)

## Choice Based Credit System(CBCS) Syllabus

## Under National Education Policy (NEP 2020)

To be implemented from Academic Year 2025-2026

# Title of the Course: B.Sc. (Computer Science)

**Preamble:**

The B. Sc. (Computer Science) and B. Sc. (Computer Science) (Honors) and (Research) course is a systematically designed program with Computer Science as a majorsubjectunderthefacultyofScienceandTechnology.Theobjectiveofthecourseis to prepare students to undertake careers involving problem solving using computer science and technologies, or to pursue advanced studies and research in computer science. The syllabus which comprises of Computer Science (Major) subject along with that of the three allied subjects (Mathematics, Electronics and Statistics) (Minor)covers the foundational aspects of computing sciences and also develops the requisite professional skills and problem solving abilities using computing sciences.

**Introduction:**

At the first year of under-graduation, the basic foundations of two important skills required for software development are laid. A course in problem solving and programming along with a course in database fundamentals forms the preliminary skill set for solving computational problems. The practical courses are designed to supplement the theoretical training in the year. Along with Computer Science (Major), VSC and SEC courses help in building a strong technical foundation. Another aspect of this course is IKS which tells about the rich heritage and advancement of India in the field of computation.

In the second year of under-graduation, computational problem solving skills are further strengthened by a course in Data structures, C++ and python programming. Software engineering concepts that are required for project design are also introduced. Essential concepts of computer networking are also introduced this year. The practical course included in both semesters complements the theory courses. Field projects/ OJT are introduced so that students can implement the concept they have learnt in first year.

*In Second Year, the "Subject 1 : Computer Science" will be the Major Subject and the Minor subject will be chosen from "Subject 2 or Subject 3". Subject 2 and Subject 3 will not be available as Major Subjects in Second Year and Third Year*

At the third year of under-graduation, all the subjects are designed to fulfill core Computer Science requirements as well as meet the needs of the software industry. Theory courses are adequately supplemented by hands-on practical courses. Major elective courses are taking care of recent advancement in the field of computer science. Minor and Skill Enhancement courses enable the students to acquire additional skills.

At the fourth year (honors) and (research) of under-graduation, all the subjects are designed to fulfill core Computer Science requirements as well as meet the needs of the software industry. Practical courses and field projects enable students to get hands-on training. Various learning tracks are open through Major elective courses. Research methodology course will create interest among the students to carry research in the field of computer science.

**Objectives:**

- To develop problem solving abilities using a computer.
- Tobuildthenecessaryskillsetandanalyticalabilitiesfordevelopingcomputer based solutions for real life problems.
- To train students in professional skills related to the Software Industry.
- To prepare the necessary knowledge base for research and development in Computer Science.
- Tohelpstudentsbuild-upasuccessfulcareerinComputerScienceandtoproduce entrepreneurs who can innovate and develop software products.

**Eligibility**

a) H.S.C.(10 + 2) Science stream with Mathematics.
b) Three years diploma course after S.S.C.($10^{th}$std.)of Board of Technical Education conducted by Government of Maharashtra or its equivalent.

**Programme Outcomes:**

| PO No | Outcomes |
|---|---|
| PO1 | Develop creative skills, critical thinking, analytical skills and research to address the real world problems using computational skills |
| PO2 | Understand and apply mathematical foundation, computing and domain knowledge and develop computing models for defined problems |
| PO3 | Understand software project management and computing principles with computing knowledge to manage projects in multidisciplinary environments |
| PO4 | Illustrate the concepts of systems fundamentals, including architectures and Organization ,operating systems, networking and communication |
| PO5 | Understand and apply the concepts of Digital Electronics, Computer Architecture, IoT etc. |
| PO6 | Recognize the need for and develop the ability to engage in continuous learning as a Computing professional |
| PO7 | Apply modern computing tools, skills and techniques necessary for innovative software solutions |
| PO8 | Communicate effectively with the computing community as well as society by Being able to comprehend effective documentations and presentations |
| PO9 | Gain Self Discipline and commit Professional Ethics in global economic environment |
| PO10 | Individual &Team Work: Ability to work as a member or leader in diverse teams in multidisciplinary environment |
| PO11 | Identify opportunities, entrepreneurship vision and use innovative ideas to create value and wealth for the betterment of the individual and society |

**Credit Distribution Structure for B.Sc. (CS)**

| Sem | Major 1 | | Major 2 | | Minor 1 | | Minor 2 | | GE / OE | SEC | AEC | VEC | CC | FP/OJT/CEP | IKS | VSC | Total Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FY-I | Advanced C Programming / Lab Course based on CS-151-T | | | | Graph Theory / Mathematics Practical II | | Principles of Digital Electronics / Electronics Practical Course II | | Office Automation II / Computer Fundamentals / Introduction to Google Apps II / Fundamentals of Computers II | Statistical Methods for Computer Science II | English | EVS-II | From University Basket | | | | |
| | 2T | 2P | | | 2T | 2P | 2T | 2P | 2T | 2P | 2T | 2T | | | 2T | | 22 |
| | 30 | 60 | | | 30 | 60 | 30 | 60 | 30 | 60 | 30 | 30 | | | 30 | | |
| | 2/W | 4/W | | | 2/W | 4/W | 2/W | 4/W | 2/W | 4/W | 2/W | 2/W | | | 2/W | | |
| | | | | | | | | | | | | | | | | | |
| FY-II | Advanced C Programming / Lab Course based on CS-151-T | | | | Graph Theory / Mathematics Practical II | | Principles of Digital Electronics / Electronics Practical Course II | | Office Automation II / Computer Fundamentals / Introduction to Google Apps II / Fundamentals of Computers II | Statistical Methods for Computer Science II | English | EVS-II | From University Basket | | | | |
| | 2T | 2P | | | 2T | 2P | 2T | 2P | 2T | 2P | 2T | 2T | 2T | | | | 22 |
| | 30 | 60 | | | 30 | 60 | 30 | 60 | 30 | 60 | 30 | 30 | 30 | | | | |
| | 2/W | 4/W | | | 2/W | 4/W | 2/W | 4/W | 2/W | 4/W | 2/W | 2/W | 2/W | | | | |
| | | | | | | | | | | | | | | | | | |

# Tikaram Jagannath Arts, Commerce and Science College

## Name of Program:-B.Sc.(Computer Science)

**Major Course:-Computer Science**

**Level:- 4.5 (First Year)** **Sem:-I**

| Course Type | Course Code | Course Title | Credits | | Teaching Scheme Hr/Week | | Evaluation Scheme and Max Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | TH | PR | TH | PR | CE | EE | Total |
| Subject 1 | UCS1CMT1 | Problem Solving using computer and ‘ C’ Programming | 2 | | 2 | | 20 | 30 | 50 |
| | UCS1 CM P1 | Lab Course based on UCS1CMT1 Problem Solving using computer and ‘ C’ Programming | | 2 | | 4 | 20 | 30 | 50 |
| Subject 2 | UCS1 MTT1 | Matrix Algebra | 2 | | 2 | | 20 | 30 | 50 |
| | UCS1 MTP1 | Mathematics Practical I | | 2 | | 4 | 20 | 30 | 50 |
| Subject 3 | UCS1 ELT1 | Principles of Analog Electronics | 2 | | 2 | | 20 | 30 | 50 |
| | UCS1 ELP1 | Electronics Practical Course I | | 2 | | 4 | 20 | 30 | 50 |
| IKS(2) | UCS1 IKS | Generic IKS | 2 | | 2 | | 20 | 30 | 50 |
| GE/OE* (2) | (OE) UCA1OE1BM | Business Mathematics | 2 | | 2 | | 20 | 30 | 50 |
| SEC (2) | UCS1SECSTP | Statistical Methods for Computer Science I | | 2 | | 4 | 20 | 30 | 50 |
| AEC(2) | UCS1 AECENG | English | 2 | | 2 | | 20 | 30 | 50 |
| VEC(2) | UCS1 VECENV | EVS-I | 2 | | 2 | | 20 | 30 | 50 |
| **Total** | | | 14 | 08 | 14 | 16 | | | 550 |

**The subjects offered to the faculty students under OE vertical are OE-101-CS-P/OE-102-CS -T/OE-103-CS-P/OE-104-CS-T.The students of B.Sc.(Computer Science) will opt the subjects offered by other faculty given in College Basket.*

**Level:- 4.5 (First Year)** **Sem:-II**

| Course Type | Course Code | Course Title | Credits | | Teaching Scheme Hr/Week | | Evaluation Scheme and Max Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | TH | PR | TH | PR | CE | EE | Total |
| Subject 1 | UCS2CMT1 | Advanced C Programming | 2 | | 2 | | 20 | 30 | 50 |
| | UCS2 CM P1 | Lab Course Based on UCS2CMT1 Advanced C Programming | | 2 | | 4 | 20 | 30 | 50 |
| Subject 2 | UCS2 MTT1 | Graph Theory | 2 | | 2 | | 20 | 30 | 50 |
| | UCS2 MTP1 | Mathematics Practical II | | 2 | | 4 | 20 | 30 | 50 |
| Subject 3 | UCS2 ELT1 | Principles of Digital Electronics | 2 | | 2 | | 20 | 30 | 50 |
| | UCS2 ELP1 | Electronics Practical Course II | | 2 | | 4 | 20 | 30 | 50 |
| GE/OE* (2 ) | (OE) UCA2OE2BS | Business Statistics | | 2 | | 4 | 20 | 30 | 50 |
| SEC(2) | UCS2SECSTP | Statistical Methods for Computer Science II | | 2 | | 4 | 20 | 30 | 50 |
| AEC(2) | UCS2 AECENG | English | 2 | | 2 | | 20 | 30 | 50 |
| VEC(2) | UCS2 VECENV | EVS-II | 2 | | 2 | | 20 | 30 | 50 |
| CC(2) | UCS2CC | From College Basket | 2 | | 2 | | 20 | 30 | 50 |
| **Total** | | | 12 | 10 | 12 | 20 | | | 550 |
| | | | | | | | | | |

**The subjects offered to the faculty students under OE vertical are OE-101-CS-P/OE-102-CS -T/OE-103-CS-P/OE-104-CS-T.*

*The students of B.Sc.(Computer Science subjects offered by other faculty given in College Basket.*

# Semester I

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**
**KHADKI, PUNE-03**
**(Autonomous)**
**F.Y.B.Sc. (Computer Science) - Sem – I**
**Course Type:**
**Code: UCS1CMT1**
**Course Title: Problem Solving Using Computers and 'C' Programming**

| Teaching Scheme 02 Hrs/ week | No. of Credits 2 | Examination Scheme IE:20marks UE: 30marks |
|---|---|---|

**Prerequisites**

- Previous knowledge of any programming concepts is assumed.
- Knowledge of mathematical operators.
- Students think out of the box i.e. imagination power.

**Course Objectives**

- To introduce the foundations of computing, programming and problem-solving using computers.
- Todeveloptheabilitytoanalyzeaproblemanddeviseanalgorithmtosolveit.
- To formulate algorithms, pseudo codes and flowcharts for arithmetic and logical problems.
- To understand structured programming approaches.
- To implement algorithms in the 'C' language.
- To test, debug and execute programs.

**Course Outcomes**

On completion of the course, student will be able to :

- Explore algorithmic approaches to problem solving.
- Control the sequence of the program and give logical outputs.
- Understand and manage Input /Output operations in 'C' program
- Develop modular programs using control structures and arrays in 'C'.

**Course Contents**

| **Chapter 1** | **Problem Solving Aspects and 'C' Fundamentals** | **8Hrs** |
|---|---|---|

Introduction to problem solving using computers.
Problem solving steps.
Algorithms-definition, characteristics, examples, advantages and limitations.
Flowcharts-definition, notations, examples, advantages and limitations, Comparison with algorithms.
Programming Languages as tools, programming paradigms, types of languages

Compilation process(compilers, interpreters),linking and loading, syntax and semantic errors, testing a program
History of ‘C’ language.
Structure of a ‘C’ program.
‘C’ Program development life cycle.
‘C’ tokens
Character set, Keywords , Identifiers
Variables, Constants(character,integer,float,string,escapesequences,enumeration constant).
Data Types (Built-in and user defined data types).
Operators, Expressions, types of operators, Operator precedence and Order of evaluation.
Character input and output.
String input and output.
Formatted input and output.

| **Chapter 2** | **Control Structures** | **7Hrs** |
|---|---|---|

Decision making structures:- if ,if-else, switch and conditional operator.
Loop control structures:- while ,do while, for.
Use of break and continue.
Nested structures.
Unconditional branching (goto statement).

| **Chapter 3** | **Functions** | **7Hrs** |
|---|---|---|

Concept of function, Advantages of Modular design.
Standard library functions.
User defined functions:-declaration, definition, function call, parameter passing (by value, by reference), and return statement.
Recursive functions.
Scope of variables and Storage classes.

| **Chapter 4** | **Arrays** | **8Hrs** |
|---|---|---|

Concept of array.
Types of Arrays–One, Two and Multidimensional array.
Array Operations - declaration, initialization, accessing array elements.
Memory representation of two-dimensional array (row major and column major)
Passing arrays to function.
Array applications - Finding maximum and minimum, Counting occurrences, Linear search, Sorting an array (Simple exchange sort, bubble sort), Merging two sorted arrays, Matrix operations (trace of matrix, addition, transpose, multiplication, symmetric, upper/ lower triangular matrix )
String Literals, string variables, declaration, definition, initialization.

**Reference Books:**


R1. C: the Complete Reference, Schildt Herbert, 4th edition, McGraw Hill

R2. A Structured Programming Approach Using C, Behrouz A.Forouzan, Richard F.Gilberg, Cengage Learning India

R3.The‘C’programminglanguage,Brian Kernighan,DennisRitchie,PHI R4. Programming in C ,A Practical Approach, Ajay Mittal , Pearson

R5.ProgrammingwithC,B.Gottfried,3rdedition,Schaum’soutlineSeries,TataMcGraw Hill.

R6.ProgramminginANSIC,E.Balagurusamy,7thEdition,McGrawHill.

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**
**KHADKI, PUNE-03**

## (Autonomous–Affiliated to Savitribai Phule Pune University)

**F.Y.B.Sc. (Computer Science) - Sem –I**

**CourseType:Subject1 Code:UCS1CMP1**

**Course Title: Lab Course based on UCS1CMT1Problem Solving using computer and ‘ C’ Programming**

| TeachingScheme3 | No. of Credits | Examination Scheme |
|---|---|---|
| 4 Hrs /Week | 2 | IE:20Marks<br>UE: 30Marks |

**Prerequisites**

- Previous knowledge of any programming concepts is assumed.
- Knowledge of mathematical operator.
- Student think the out of box ie imagination power.

**Course Objectives**.

- Explore and develop the algorithmic approaches to problem solving.
- Understand and implement modular programs using control structures and arrays in ‘C’.
- Implement programming logic and also test, debug and execute programs.
- Implement Control the sequence of the program and give logical outputs.

**Course Outcomes**:-

On completion of this course, students will be able to:

- Explore and develop the algorithmic approaches to problem solving.
- Understand and implement modular programs using control structures and arrays in ‘C’.
- Implement programming logic and also test, debug and execute programs.
- Implement Control the sequence of the program and give logical outputs.

**Guidelines:**

**Lab Book:** The lab book is to be used as a hands-on resource, reference and record of assignment submission and completion by the student. The lab book contains the setoff assignments which the student must complete as a part of this course.

**Submission:**

Problem Solving Assignments:

The problem solving assignments are to be submitted by the student in the form of a journalcontainingindividualassignmentsheets.EachassignmentincludestheAssignmentTitle,Problem statement, Date of submission, Assessment date, Assessment grade and instructors sign.

Programming Assignments:

Programs should be done individually by the student in the respective login. The codes should be uploaded on either the local server, Moodle, Github or any open source LMS. Print-outs of the programs and output may be taken but not mandatory for assessment.

**Assessment:**

Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes and good programming practices.

**Operating Environment:**

For 'C' Programming:

Operating system: Linux

Editor: Any linux based editor like vi, edit etc.

Compiler: cc or gcc

**LAB Course Contents**

**A)C Programming**

| **Assignment 1** | **Problem Solving Aspects** |
|---|---|
| • Pseudo-code to programs.<br>• Compilation process(compilers, interpreters),linking and loading, syntax and semantic errors, testing a program<br>• Practices (naming conventions, documentation, indentation). | |
| **Assignment 2** | **'C' Fundamentals** |
| • 'C' tokens and Character set, Keywords , Identifiers<br>• Character, integer, float, string, escape sequences, enumeration constant.<br>• Built-in and user defined data types and Operators, Expressions, types of operators, Operator precedence and Order of evaluation. | |
| **Assignment 3** | **Control Structures: Conditional Structures** |

- Use of if ,if-else, and.
- Use of Switch case
- Use of conditional operator

| **Assignment 4** | **Control Structures : Loop Control Structures** |
|---|---|

- Use ofWhile loop
- Use of Do While loop
- Use of for lo
- Use of break and continue.
- Nested structures and goto statement.

| **Assignment 5** | **Control Structures: Break continue and Nested Loop** |
|---|---|

- Use of break and continue.
- Nested structures and goto statement.

| **Assignment 6** | **Functions** |
|---|---|

- User defined functions:-declaration, definition, function call, parameter passing(by value), return statement.

| **Assignment 7** | **Recursive Functions** |
|---|---|

- Use of Recursive functions.

| **Assignment 8** | **Scope of variables** |
|---|---|

- Use of Scope of variables
- Use of Storage classes.

| **Assignment 9** | **One Dimensional Arrays** |
|---|---|

- One Dimensional Arrays(1D)Operations-declaration, initialization, accessing array elements.

| **Assignment 10** | **One Dimensional Arrays : passing array to function** |
|---|---|

- Assignment on Passing 1Darrays to function

| **Assignment 11** | **One Dimensional Arrays : Array Operations** |
|---|---|

- Finding maximum and minimum, Counting occurrences, Linear search,

| **Assignment 12** | **One Dimensional Arrays : Sorting and Searching** |
|---|---|

- Sorting an array (Simple exchange sort, bubble sort (i.e. arrange the data in ascending and descending order))

| **Assignment 13** | **Two Dimensional Arrays: Basic Operations** |
|---|---|

- Two and Multi dimensional array (2D)Operations- declaration ,initialization, accessing array.

| **Assignment 14** | **TwoDimensionalArrays:Passing2Darraysto functions** |
|---|---|

- Passing2Darraystofunction.
- Merging two sorted arrays,

| **Assignment 15** | **Two Dimensional Arrays: matrix operations** |
|---|---|

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**
**KHADKI, PUNE-03**

## (Autonomous–Affiliated to Savitribai Phule Pune University)

**F.Y.B.Sc. (Computer Science) - Sem –I**
**Course Type: Subject 2 Code:UCS1MTT1**
**Course Title :Matrix Algebra**

| TeachingScheme | No.ofCredits 2 | Examination Scheme |
|---|---|---|
| 02 Hrs / week | | IE:20marks<br>UE: 30marks |

Aims :

- To give the students sufficient knowledge fundamental principles,methods and a clear perceptionofinnumerouspowerofmathematicalideasandtoolsandknowhowtousethem by modeling, solving and interpreting.
- Reflectingthebroadnatureofthe subject anddevelopingmathematicaltoolsforcontinuing further study in various fields of science.
- Enhancingstudents'overalldevelopmentandtoequipthemwithmathematicalmodeling abilities, problem solving skills,
- Creative talent and power of communication necessary for variouskinds of employment.
- Enablingstudentstodevelopapositiveattitude towardsmathematicsasaninterestingand valuable subject of study
- Totest,debugandexecuteprograms.

**Course Objectives**

- Astudentshouldbeabletorecallbasicfactsaboutmathematicsandshouldbeabletodisplay knowledge of conventions such as notations, terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies.
- Astudentshouldgetarelationalunderstandingofmathematicalconceptsandconcerned structures, and should be able to follow the patterns involved, mathematical reasoning.
- Astudentshouldgetadequateexposuretoglobalandlocalconcernsthatexplorethemmany aspects of Mathematical

**Course Outcomes**

Upon successful completion of this course, the student will be able to:

- Workwithgraphsandidentifycertainparametersandpropertiesofthegivengraphs.
- Performcertainalgorithms,justifywhythesealgorithmswork,andgivesomeestimatesofthe running times of these algorithms.
- Solvebasicexercisesofthetype:givenagraphwithpropertiesX,provethatthegraphalso has property Y.
- Developan appreciation for the literature on the subject and be able to read andpresent results from the literature.
- Writecohesiveandcomprehensivesolutionstoexercisesandbeabletodefendtheir arguments.

Course Contents

| | | |
|---|---|---|
| **Chapter 1** | **Matrices** | **10 Hrs** |

Matrix Operations
Elementary Matrices,Elementary Row operations
Rowreduction and echelon forms
LU factorization of a matrix

| **Chapter 2** | **Determinants** | **5 Hrs** |
|---|---|---|

Introduction to determinants

Properties of determinants

Determinant by Row reduction

Determinant by Cofactor expansion along any row or column

| **Chapter 3** | **Invertible matrices** | **5Hrs** |
|---|---|---|

3.1 The inverse of a matrix
Characterization of invertible matrices
TofindinverseofamatrixbyRow reduction
TofindinverseofamatrixbyAdjoint Method

| **Chapter 4** | **Linear Equations** | **10 Hrs** |
|---|---|---|

System of Linear equations
The matrix equation Ax=b
Gauss Elimination Method
Cramer'srule
Application ofLU decompositionto solve system Ax=b

**Books:**

**Text Book :** Linear Algebra and its Applications (5th Edition)

DavidCLay,StevenR.Lay,JudiJ.MacDonald Pearson

Publication,2016

ISBN 978-0-321-98238-4

Unit 1: Sections 1.1, 1.2, 1.3.

Unit 2 : Sections 3.1, 3.2.

Unit 3 : Sections 2.1, 2.2, 2.3.

Unit 4: Sections 1.4, 1.5,1.6 , 3.3.

**ReferenceBooks:**


1. ElementaryLinearAlgebrawithsupplementalApplications
   Author : Howard Anton and othersWileyStudentEdition
2. MatrixandLinearAlgebra(aidedwithMATLAB)
   Author :Kanti Bhushan Datta Eastern Economic
   Edition

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**

**KHADKI, PUNE-03**

**(Autonomous–Affiliated to Savitribai Phule Pune University)**

**F.Y.B.Sc. (Computer Science) - Sem –I**

**Course Type: Subject 2 Code:UCS1MTP1**

**Course Title :Mathematics Practical I**

| Teaching Scheme 3 4 Hrs /Week | No.ofCredits 2 | ExaminationScheme IE:20 Marks UE: 30Marks |
|---|---|---|

| **Assignment 1** | **Introductionto Python** |
|---|---|

- InstallationofPython
- ValuesandTypes:int,float,stretc
- Variables:assignmentstatements,printingvariablevalues,types of variables
- Booleanoperators,Logicaloperators
- Mathematicalfunctionsfrommath,cmath,modules.

| **Assignment 2** | **Python Strings** |
|---|---|

- Accessing values in strings
- Updating strings
- String special operators
- Concatenation
- Repetition

| **Assignment 3** | **Python List and Python Tuple** |
|---|---|

- Accessing Values
- Updating
- Deleteelements
- Basicoperations
- Indexing, Slicing
- Built-in Functions

| **Assignment 4** | **Python Set** |
|---|---|

- Tocreatea set
- TochangeasetinPython
- Toremoveelementsfromaset
- Python Set Operations
- Built-in Functions with Set

| **Assignment 5** | **PythonDictionary** |
|---|---|

- TocreateaDictionary
- TochangeaDictionaryinPython
- ToremoveelementsfromaDictionary
- PythonDictionary Operations
- Built-in Functions with Dictionary.

| **Assignment 6** | **Decision making Statements** |
|---|---|

- IF statement
- IF...ELIF...ELSEStatements:
- Nested IF statements:
- while loop
- for loop

| Assignment 7 | Use SymPyfor basic Operations On Matrices |
|---|---|
| • Addition, Subtraction , Multiplication , poweretc<br>• ToAccessingelements,Row,ColumnofMatrix.<br>• To createsomestandardMatrices. | |
| **Assignment 8** | **Use SymPy for Operations on Matrices** |
| • Toinsertanelementinanyroworcolumn<br>• Toinsertmatrixintomatrix<br>• Todeleteanyrowor column<br>• Elementary row opreations | |
| **Assignment 9** | **Use Sympytoobtain** |
| • Thedeterminants ofMatrix.<br>• The rank ofMatrix<br>• The transpose Of Matrix<br>• The reduced row echelon form of Matrix | |
| **Assignment 10** | **Use SymPytoobtain** |
| • The inverse of a matrix<br>• The inverse of a matrix by Row reduction<br>• The minor and co factors of matrix<br>• The inverse of a matrix by Adjoint Method | |
| **Assignment 11** | **UseSymPytoobtain** |
| • Lower triangular matrix<br>• Upper triangular matrix | |

| • LU decomposition of matrix | |
|---|---|
| **Assignment 12** | **UseSymPytosolve System of Linearequations** |
| • Cramer'sRule<br>• Gauss Elimination Method<br>• Gauss Jordan Method<br>• LU decomposition Method. | |

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**
**KHADKI, PUNE-03**
**(Autonomous–Affiliated to Savitribai Phule Pune University)**
**F.Y.B.Sc. (Computer Science) - Sem –I**
**Course Type: Subject 3 Code:UCS1ELT1**
**Course Title : Principles of Analog Electronics**

| TeachingScheme<br>02 Hrs/ week | No.ofCredits 2 | ExaminationScheme<br>IE : 20 marks<br>UE: 30marks |
|---|---|---|

**Course Objectives**

- Tostudyvarioustypesofsemiconductordevices
- Tostudyelementaryelectroniccircuitsand systems
- TostudyInstrumentationSystem
- Tostudyvariousblocksofinstrumentation System
- Tostudysmartinstrumentationsystem

**Course Outcomes**

- Understand the concept of semiconductor diodes.
- UnderstandthedifferentapplicationsofFET,BJTand MOSFET.
- Understandworkingprincipleofdifferentsensors.
- UseOp-ampfordifferentapplication.

Course Contents

| **Chapter 1** | **Semiconductor Diodes** | **05 Hrs** |
|---|---|---|

Semiconductor,PandNtypesemiconductors,FormationofPNjunctiondiode,it'sworking. Zener diode, LED, Photo diode (Symbol, working principal, list of applications only)

| **Chapter 2** | **BipolarJunctionTransistor(BJT)** | **05 Hrs** |
|---|---|---|

Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, Transistor. Amplifier configurations - CB, CC (only concept), CE configuration: input and output characteristics, Definition of α, β and ϒ , Concept of Biasing (numerical problems not expected),

| **Chapter 3** | **Oscillators** | **05Hrs** |
|---|---|---|

BarkhausonCriteria,LowfrequencyWein-bridgeoscillator,HighfrequencycrystaloscillatorBarkhausonCriteria,LowfrequencyWein-bridgeoscillator,Highfrequencycrystaloscillator

| **Chapter 4** | **Data converters** | **05 Hrs** |
|---|---|---|

Need of Digital to Analog converters, parameters, weighted resistive network, R-2R ladder network, need of Analog to Digital converters, parameters, Flash ADC

| **Chapter 5** | **Introduction to Instrumentation System** | **05 Hrs** |
|---|---|---|

Block diagram of Instrumentation system, Definition of sensor and transducer Classification of sensors: Active and passive sensors. Specifications of sensors: Accuracy, range, linearity, sensitivity, resolution, reproducibility. Temperature sensor (Thermistor, LM-35), Passive Infrared sensor (PIR),

Actuators: DC Motor, stepper motor

| **Chapter 6** | **OPAMP as signal Conditioner** | **05 Hrs** |
|---|---|---|

Concept, block diagram of Op amp, basic parameters (ideal and practical): input and output impedance, bandwidth, differential and common mode gain, CMRR, slew rate, IC741/ LM324, Concept of virtual ground.

**Reference Books:**


1. Electronic Devices and Circuits I–T. L.Floyd-PHI Fifth Edition
2. Principles of Analog Electronics-A.P.Malvino
3. Sedha R.S.,A Text Book Of Applied Electronics, S.Chand & Company Ltd
4. Sensors and Transducers: D.Patranabis, PHI publication, 2nd Edition
5. Sensors and Transducers: Prof A. D. Shaligram
6. Op Amp and Linear Integrated Circuits: Ramakant Gaykwad

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**
**KHADKI, PUNE-03**

## (Autonomous–Affiliated to Savitribai Phule Pune University)

**F.Y.B.Sc. (Computer Science) - Sem –I**

**Course Type: Subject 3 Code:UCS1ELP1**

**Course Title : Electronics Practical Course I**

| TeachingScheme | No.ofCredits 2 | ExaminationScheme |
|---|---|---|
| 04 Hrs/ week | | IE : 20 marks<br>UE: 30marks |

**Course Objectives**

- Tostudydifferentsemiconductordiodes.
- TounderstandapplicationsofIC555asa multivibrator.
- Tostudydifferentapplicationsofop-amp.
- Tounderstandapplicationsofsensors

**Course Outcomes**

- Usedifferentsemiconductordiodesforvarious applications.
- UnderstandthedifferentapplicationsofFET,BJTand MOSFET.
- Useofdifferentsensorsforparameter measurement

Course Contents

**GroupA(Any13)**

| | |
|---|---|
| 1. | Study of forward and reverse bias characteristics of PN junction diode. |
| | Study of Zener diode as a voltage regulator |
| 3. | Study of Transistor as a switch. |
| 4. | Study of IC 555 as astable multivibrator used as square wave generator / clock |
| 5. | Study of Digital to Analog Converter using R-2R ladder network |
| 6. | Study of optical sensor (LDR) |
| 7. | Study of temperature sensor (LM35) |
| 8. | Study of PIR sensor |
| 9. | Study of Study of Op amp as inverting/non-inverting amplifier |
| 10. | Op Amp as a Unity gain follower |
| 11. | Study of Op-amp as adder/subtractor |
| 12. | Study of Flash ADC. |
| | |

| | |
|---|---|
| | |

**Group B: Activity (Any1:Equivalent to2 Practical's)**

1. Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, Transistor. Amplifier configurations - CB, CC (only concept), CE configuration: input and output characteristics, Definition of α, β and ϒ, Concept of Biasing (numerical problems not expected), Identification of components (Passive and Active) and study of multimeter -

   a. Minimum10differenttypes of components are expected.

   b. Identification based on visual inspection / data sheets.

   c. Measure the various parameters using multimeter.

2. Technical survey of 5 electronic appliances used in different fields (Home,Hospital, Agriculture, Chemical industry, Automobile industry)

*(Note:basicsofthedeviceswillbeexplainedintheoryandpracticalwillbebasedon Applications of different types and configurations of the devices learnt in theory. Inthiswaythey will earninclassaswellasinlabandmoreconceptscanbecoveredingivennumberof credits.)*

**Suggested Readings/Material:**


1. ElectronicDevicesandCircuitsI–T.L.Floyd-PHIFifthEdition
2. Principles of Analog Electronics - A.P.Malvino
3. SedhaR.S.,ATextBookOfAppliedElectronics,S.Chand&CompanyLtd
4. SensorsandTransducers:D.Patranabis,PHIpublication,2ndEdition
5. SensorsandTransducers:ProfA.D.Shaligram
6. Op Amp and Linear Integrated Circuits: Ramakant Gaykwad


**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**
**KHADKI, PUNE-03**
**(Autonomous–Affiliated to Savitribai Phule Pune University)**
**F.Y.B.Sc. (Computer Science) - Sem –I**
**Course Type: GE/OE Code: UCS1OECST1**
**CourseTitle:OfficeAutomationI**

| TeachingScheme | No.ofCredits 2 | ExaminationScheme |
|---|---|---|
| 02 Hrs/ week | | IE : 20 marks<br>UE: 30marks |

**Prerequisites**

- Previous knowledge of Computer concepts is assumed.
- Knowledge of Computer as operational tool is required.

**Course Objectives**

- Tointroducethefoundationsofofficeautomationespeciallyword processing.
- Todeveloptheabilitytopreparethewellformattedworddocuments.
- Topreparethedocumentsusingwordprocessingtoolssuchastables,figures,shapesetc.
- Toprepareth eworddocumentsusingadvancedautomated features.

**Course Outcomes**

On completion of the course, student will be able to :

- Prepare the professional word documents
- Explore various tools in the word processing software.
- Develop documents using word processing advanced tools.

**Course Contents**

| | | |
|---|---|---|
| **Chapter 1** | **WorkingwithDocuments**. | **2 Hrs** |

Opening & Saving files,
Editing text documents, Inserting, Deleting,
Cut,Copy,Paste,Undo,Redo,
Find, Search, Replace,
Formatting page &setting Margins,
Convertingfilestodifferentformats,
Importing & Exporting documents, Sending files to others,

1.8.UsingToolbars,Ruler,UsingIcons,usinghelp

| | | |
|---|---|---|
| **Chapter 2** | **Formatting Documents** | **2 Hrs** |

Setting Font styles
Fontselection-style,size,colour,etc.
Typeface-Bold,Italic,Underline,
, Case settings, Highlighting, Special symbols.
Setting Paragraph style.
Alignments, Indents, Line Space, Margins,
, Bullets &Numbering

| | | |
|---|---|---|
| **Chapter 3** | **Setting Page Style** | **4 Hrs** |

Formatting Page
Pagetab:Margins, Layoutsettings, Papertray
Border &Shading
Columns
Header &Footer
Setting Footnotes & End notes
Shortcut Keys; Inserting manual page break, Column break and line break
Creating sections &frames
Anchoring &Wrapping
Printing Documents

| | | |
|---|---|---|
| **Chapter 4** | **Setting Document Styles** | **2 Hrs** |

TableofContents
Index
Page Numbering
Date&Time,Author, etc.
Creating Master Documents
Webpage

| | | |
|---|---|---|
| **Chapter 5** | **CreatingTables** | **7 Hrs** |

TablesettingsandDrawing-InsertingClipArts,Pictures/Files etc.,
Borders, Alignments,
Insertion, deletion,
,Merging, Splitting,
Sorting,
Formula

| Chapter 6 | Special Features | 6 Hrs |
|---|---|---|

Inserting Formula, equation, symbols
Inserting Cliparts, pictures, objects, word art
Drawing: shapes, smart art, etc
Charts
Hyperlinks, bookmarks, cross-references, Digital Signature

| Chapter 7 | Tools | 7 Hrs |
|---|---|---|

WordCompletion,SpellChecks,
Mail merge
Templates,Creatingcontentsforbooks,CreatingLetter/Faxes,CreatingWebpages7.5Hyperlinks, bookmarks, cross-referencesUsing WizardsTrackingChanges,Security,.

**ReferenceBooks:**


1. IllustratedMicrosoftOffice365&Word2019ComprehensivebyJennifer Duffy
2. MicrosoftWord3652019byJoanLambert
3. MicrosoftWord2013BiblebyLisaA Bucki


**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**
**KHADKI, PUNE-03**

## (Autonomous–Affiliated to Savitribai Phule Pune University)

**F.Y.B.Sc. (Computer Science) - Sem –I**

**CourseType:GE/OECode:OE-102-CS-T**

**CourseTitle:IntroductiontoComputersandBasicsofInternet**

| TeachingScheme | No.ofCredits | ExaminationScheme |
|---|---|---|
| 02 Hrs/ week | 2 | IE : 20 marks<br>UE: 30marks |

**Prerequisites**

- Basic knowledge of Computer concepts is assumed.
- Knowledge of Computer as operational tool is required.

**Course Objectives**

- Tointroducethefundamentalconceptsof computers
- Tointroducethebasicconceptsof Internet
- Todeveloptheabilitytoanalysesandusethecomputerperipheralseffectively
- Todeveloptheabilitytoanalysesandusetheinterneteffectively

**Course Outcomes**

On completion of the course, student will be able to :

- Use the computer peripherals effectively
- Use the internet for the day to day life
- Explore various applications available over the internet.

**Course Contents**

| **Chapter 1** | **Fundamentals of Computers** | **8 Hrs** |
|---|---|---|

OverviewofaComputer-Definition,functionalitiesof Computer
Generations and Classification of Computers
Functional Components of a Computer
Applications Of Computers
Software and Hardware-Definition, types of software

1.6 Introduction to various Operating systems-Windows,Linux,Android,IOS

| **Chapter 2** | **IntroductiontovariousComputerapplications** | **6 Hrs** |
|---|---|---|

VariousExplorersEditors such as Notepad, wordpad
Calculator,calendar,etc, Paint.VariousbrowsersInternet settings

| **Chapter 3** | **Basics of Internet** | **6 Hrs** |
|---|---|---|

Definition and History of Internet
Uses and Applications of Internet
Definition of Web
WebsiteAddressandURL
DifferenttypesofInternetConnections:

- Dial up Connection
- Broad Band ( ISDN, DSL, Cable)
- Wireless(Wi-Fi,WiMax,Satellite,Mobile)namingconvention

3.6ModesofConnectingInternet(Hotspot,Wi-Fi,USBTethering)

| **Chapter 3** | **Browsersand Email** | **10 Hrs** |
|---|---|---|

Search Engines
WebBrowsers

- PopularWebBrowsers(MicrosoftEdge,GoogleChrome,MozillaFirefox,Safari, etc.)
- Popular Search Engines.(Google, Bing, Startpage ,DuckDuckGo etc.. )

Portals

Social Networking sites, blogs
Using Browsers :

- Viewingwebpage
- Downloading and uploading the website

3.6E-mail:

- Configuring an E-mail Account
- Composing and Sending Mail
- Receiving, Replying to and Forwarding Mail
- Attachments to email

**ReferenceBooks**:

1.ComputerFundamentalsby P.K.Sinha&PritiSinha,3rdedition,BPBpub.
2.Fundamental of Computers – By V. Rajaraman B.P.B. Publications
3. The Internet Book by Douglas E Comer

E-Books and Online Learning Material

1. https://www.geeksforgeeks.org/computer-fundamentals-tutorial/
2. https://www.javatpoint.com/computer-fundamaentals

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**
**KHADKI, PUNE-03**
**(Autonomous–Affiliated to Savitribai Phule Pune University)**
**F.Y.B.Sc. (Computer Science) - Sem –I**
**CourseType:GE/OECode:UCS1OECST2**
**CourseTitle:IntroductiontoGoogleAppsI**

| TeachingScheme | No.ofCredits 2 | ExaminationScheme |
|---|---|---|
| 02 Hrs/ week | | IE : 20 marks<br>UE: 30marks |

**Prerequisites**

- Basic knowledge of Computer concepts is assumed.
- Knowledge of Computer as operational tool is required.
- Knowledge of Internet is required

**Course Objectives**

- TointroducethefoundationsofvariousGoogle tools.
- Todeveloptheabilitytoanalysesandusethetoolseffectively

**Course Outcomes**

On completion of the course, student will be able to :

- Use the Google tools for the day to day life
- Explore various applications available in the Googletools.
- Develop the skills to implement the skills available in the Googletools.

**Course Contents**

| **Chapter 1** | **Gmail** | **2 Hrs** |
|---|---|---|

Configuring an E-mail Account
Composing and Sending
Mail1.3Receiving,ReplyingtoandForwardingM
ail
1.4 Attachments to email

| **Chapter 2** | **Google Drive** | **3 Hrs** |
|---|---|---|

Opening the Drive
Creating folders, Google docs, Google sheets, Googleslides
Managing Files and folders
Sharing files and folders and managing permissions
Downloading the files and folders
Uploading files and folders
Printing files

| **Chapter 3** | **Google Docs, Sheets and Slides** | **8 Hrs** |
|---|---|---|

Creating Google docs, sheets and slides
Formatting the documents
Managing the document permissions
Uploading/downloading the documents
Special features in the docs, sheets and slides

| **Chapter 4** | **Google Forms** | **7 Hrs** |
|---|---|---|

4.1 Creating a Googleform

Adding various styles of the questions
settings of the Googleform
Creating the links of the Google form and sharing the link
Creating and managing the permissions
Managing the data collected through Googleform

| **Chapter 5** | **Other Google tools** | **10 Hrs** |
|---|---|---|

Google Calendar
Google Meet
Google Chat
Google Contacts
Google Photos
Google Maps

**ReferenceBooks**:


1. Complete Beginners guide to Google Apps Script by Daniel Lawrie.
2. Google Apps made easy by James Bernstein
3. My Google Apps by Sherry Kinkoph Gunter


**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**
**KHADKI, PUNE-03**
**(Autonomous–Affiliated to Savitribai Phule Pune University)**
**F.Y.B.Sc. (Computer Science) - Sem –I**
**CourseType:GE/OECode: UCS1OECST3**
**CourseTitle:FundamentalsofComputers I**

| TeachingScheme | No.ofCredits 2 | ExaminationScheme |
|---|---|---|
| 02 Hrs/ week | | IE : 20 marks<br>UE: 30marks |

**Prerequisites**

- Basic knowledge of Computer concepts is assumed.

**Course Objectives**

- Toconversewithbasicterminologyof computer
- TounderstandbasicsofComputerandworkingwithOperatingSystem
- Todevelopworkingskillswithproductivityenhancing tools
- Toperformdocumentationandaccountingoperations

Course Outcomes

On completion of the course, student will be able to :

- Understand the concept of input and output devices of Computers
- Learn the functional units and classify types of computers
- Understand concept of software and working of operating system
- LearnbasicWordprocessing,SpreadsheetandPresentationGraphicsSoftware skills
- StudytousetheInformationTechnologysafely,legally,andresponsibly
- Describevarioususes ofoffices automationtools inaccounting Operations

Course Contents

| Chapter 1 | **Introductionto Computers** | 15 Hrs |
|---|---|---|

1.1BasicsofComputers-Definition,BlockDiagram,ComputerHierarchy,(Classification),

CharacteristicsofComputer,ComputerMemoryInputandOutputDevices. IntroductiontoSoftware-SoftwareTypes-SystemSoftware,ApplicationSoftware,Typesof Operating Systems, Functions of Operating Systems.

Working with Windows Operating System:- Structure of Windows, Windows Explorer, File andFolderOperations,TheSearch,TheRecycleBin, Adding or Removing New Programs using, Control Panel, Applications in windows (Paint, Notepad, WordPad, and Calculator) Data Processing: Files and Records, File Organization (Sequential, Direct/Random, Index )

| Chapter 2 | **Office Automation Tools** | 15 Hrs |
|---|---|---|

DefinitionofInformationTechnology(IT)BenefitsofInformationTechnology(IT) Applications of Information Technology (IT)

OfficeAutomation Tools:

MS-Word:Introduction,StartingMS-Word,MS-WordScreenanditsComponents, Elementary Working with MS-Word

MS-Excel: Introduction, Starting MS-Excel, Basics of Spread sheet, MS-Excel Screen and its Components, Elementary Working with MS-Excel

MS-PowerPoint:Introduction,StartingMS-PowerPoint,BasicsofPowerPoint,MS-PowerPoint Screen and Its Components, Elementary Working with MS PowerPoint.

**ReferenceBooks**:


1. Computer Fundamentals by: Anita Goel, Pearson Education India ISBN: 9788131742136
2. Connectingwith Computer Science, by Greg Anderson, David Ferro, Robert Hilton, CourseTechnology, Cengage Learning,ISBN:9781439080351
3. Fundamentalsof Computer : For undergraduate courses in commerce and management, ITLEducation Solutions Limited, Pearson Education, ISBN:9788131733349
4. Introduction to Computer Science, 2/e, ITL Education Solutions Limited, Pearson Education, ISBN:9788131760307
5. Frontiers of Electronic Commerce, Ravi Kalakota, Andrew B. Whinston, Pearson Education,ISBN:9788177583922
6. Internet:TheCompleteReference,MargaretLevineYoung,TataMcGrawHillEducation Private Limited, ISBN: 9780070486997
7. On the Way to the Web: The Secret History of the Internet and ItsFounders,A.Banks,Apress Publication, ISBN: 9781430208693
8. Computers and Commerce: A Study of Technology and Management at Eckert-MauchlyComputer Company, Engineering Research Associates, and Remingto, Arthur L.Norberg,MITPress(MA),ISBN:9780262140904
9. EssentialofE-commercetechnologybyV.Rajaraman,PrenticeHallIndiaLearningPrivate Limited ISBN 9788120339378
10. FundamentalsofComputersbyE.Balagurusamy,McGrawHill
11. Computer Fundamentals by Priti Sinha, Pradeep K. Sinha, BPB Publications

| **Continuous Internal Evaluation – Max. Marks 15 Marks<br>(Min.PassingMarks: 06)(Min.Passing Percentage:40% ofMax. Marks)** | |
|---|---|
| ThecollegesneedtoadoptanyTwoMethodsoutofthefollowingMethodsforContinuous Internal Evaluation:<br>12. OfflineWrittenExamination<br>13. Power Point Presentations<br>14. Assignments / Tutorials<br>15. Oral Examination<br>16. OpenBook Test<br>17. OfflineMCQTest<br>18. Group Discussion<br>19. Analysis of Case Studies | |
| **SemesterEndExamination:Max.Marks 35 andDurationofExaminationis2Hours (Min. Passing Marks: 14)(Min. Passing Percentage: 40% of Max. Marks)** | |
| ***Instructions:***<br>*1. Attempt all questions*<br><br>Q. 1. Fill in the Blanks on all Units<br>Q. 2. Theory Question on Unit-1 OR Unit-2<br>Q. 3. Numerical Problem on Unit-1 OR Unit-2<br>Q.4.WriteShortNotesonallUnits(Any2outof 4) | <br><br><br>05 Marks<br>08 Marks<br>14 Marks<br>08 Marks |

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**
**KHADKI, PUNE-03**
**(Autonomous–Affiliated to Savitribai Phule Pune University)**
**F.Y.B.Sc. (Computer Science) - Sem –I**
**CourseType:SECCode:UCS1SECSTP**
**Course Title: Statistical Methods for Computer Science I**

| Teaching Scheme | No. of Credits | Examination Scheme |
|---|---|---|
| 04 Hrs/ week | 2 | IE : 20 marks<br>UE: 30marks |

**Prerequisites**

- Basic knowledge of Computer concepts is assumed.
- Basic Concepts of statistics is assumed.

**Course Outcomes**

On completion of the course, student will be able to :

- Present the complex data in tabular format.
- Use various diagrammatic and graphical techniques to represent statistical data and interpret the data.
- Compute various measures of central tendency, dispersion, skewness, and kurtosis using MS-Excel and interpret the results
- Establish relation between variables and estimate response for given bivariate data using software and interpret the results

List of experiments

| Sr.No. | Title of the Experiment | No. of Experiments |
|---|---|---|

| | | |
|---|---|---|
| 1 | Tabulation and construction of frequency distribution. (Use of at least two data sets more than 50 observations-each for constructing frequency distribution) | 1 |
| 2 | Diagrammatic representation of statistical data using EXCEL and data interpretation. (stem and leaf diagram,simple bar diagram, subdivided bar diagram, multiple bar diagram, percentage bar diagram, pie diagram, ) | 1 |
| 3 | Graphical representation of statistical data: Histogram and frequency curve. Determination of mode graphically, Ogivecurves and Pareto chart. Determination of median graphically. | 1 |
| 4 | Summary statistics – I: Computation of measures of central tendency for ungrouped data (AM, Median and Mode) using MS-Excel by regular formula method and using direct command. | 1 |
| 5 | Summary statistics – II: Computation of measures of central tendency for grouped data (AM, Median and Mode) using MS-Excel by regular formula method. | 1 |
| 6 | Summary statistics – III: Computation of measures of dispersion for ungrouped data (Range, quartiles, variance, standard deviation, coefficient of variation) using MS-Excel by regular formula method and by direct command. | 1 |
| 7 | Summary statistics – IV: Computation of measures of dispersion for grouped data (Range, quartiles, variance, standard deviation, coefficient of variation using MS-Excel by regular formula method.. | 1 |
| 8 | Computations of raw and central moments (not using the relation formula),measures of skewness and kurtosis (calculations in MS Excel by regular formula method , using Karl Pearson's formula and moments). | 1 |
| 9 | Scatter diagram and computation of covariance and Karl Pearson's correlation coefficient (calculations in MS-Excel by regular formula method and by direct command). | 1 |
| 10 | Fitting of line of regression $Y= a+ bX$, calculations in MS-Excel By regular formula method and by direct command (use scatter plot for explaining the linear relationship). | 1 |
| 11 | Data Collection, its condensation and representation using MS-Excel. | 1 |
| 12 | Study of statistical tools in Computer Science and preparation of a report on it. | |

| | | |
|---|---|---|

**Learning Resources**


1. Introduction to linear regression analysis (fifth edition) Douglas C. Montgomery.
2. Fundamentals of Applied Statistics (3rd Edition), Gupta and Kapoor, S. Chand and Sons, New Delhi, 1987.
3. Fundamentals of Mathematical Statistics (3rd Edition), Gupta S. C. and Kapoor V. K.1987 S. Chand and Sons, New Delhi.
4. Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). The World Press Pvt. Ltd., Calcutta
5. Mathematical Statistics (3rd Edition), Mukhopadhyay P. 2015, Books And Allied (P), Ltd.
6. Programmed Statistics, B.L. Agarwal, New Age International Publishers.


Note:

1. Every practical is equivalent to four theory lectures per batch per week.
2. One hour is reserved for theory explanation of corresponding practical.
3. For project, a group of maximum 8 students be made. All the students in a group are given equal marks for project. Different data sets from primary or secondary sources may be collected.

# Semester-II

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**
**KHADKI, PUNE-03**

## (Autonomous)

**F.Y.B.Sc. (Computer Science) - Sem – II**

**Code: UCS2CMT1**

**Course Title: :Advanced C Programming**

| TeachingScheme | No.ofCredits 2 | Examination Scheme |
|---|---|---|
| 02 Hrs/ week | | IE:20marks UE: 30marks |

**Prerequisites**

- Problem Solving tools like algorithms, flowcharts and pseudocodes.
- Basic knowledge of 'C' language.

**Course Objectives**UCS2CMT1

- Tostudyadvancedconceptsofprogrammingusingthe'C'language.
- Tounderstandcodeorganizationwithcomplexdatatypesand structures.
- Toworkwithfiles.

**Course Outcomes**

On completion of the course, student will be able to :

- Developmodularprogramsusingcontrolstructures,function,pointers,arrays,stringsand structures
- Design and develop solutions to real world problems using C.
- Understand and repeat the sequence of instructions and points for a memory location.
- Identification, analyzation, development, verify and document the requirements for a computing environment.

**Course Contents**

| **Chapter 1** | **Pointers** | **8Hrs** |
|---|---|---|

Introduction to Pointers.
Declaration, definition, initialization, dereferencing.
Pointer arithmetic.
RelationshipbetweenArrays&Pointers-Pointertoarray,Arrayofpointers.
Multiple indirection (pointer to pointer).
Functionsandpointers-Passingpointertofunction,Returningpointerfromfunction, Function pointer.
Dynamicmemorymanagement-Allocation(malloc(),calloc()),Resizing(realloc()), Releasing(free()).,
Memory leak, dangling pointers.
Typesofpointers.

| **Chapter 2** | **Strings** | **6Hrs** |
|---|---|---|

String Literals, string variables, declaration, definition, initialization.
Syntax and use of predefined string functions
Array of strings.
2.4. Strings and Pointers
2.5. Command line arguments.

| Chapter 3 | StructuresAnd Unions | 8Hrs |
|---|---|---|
| Concept of structure, definition and initialization, use of typedef.<br>Accessing structure members.<br>Nested Structures<br>Arrays of Structures<br>Structuresandfunctions-Passingeachmemberofstructureasaseparateargument,Passing structure by value / address.<br>Pointers and structures.<br>Concept of Union, declaration, definition, accessing union members.<br>Differencebetweenstructuresandunion. | | |
| **Chapter 4** | **File Handling** | **6Hrs** |
| Introduction to streams.<br>Typesoffiles.<br>Operations on text files.<br>Standard library input/output functions.<br>Random access to files. | | |
| **Chapter 5** | **Preprocessor** | **2Hrs** |
| Role of Preprocessor<br>Format of preprocessor directive<br>File inclusion directives (#include)<br>Macrosubstitutiondirective,augmentedandnested macro<br>Macros versus functions | | |

**ReferenceBooks:**


R1. C: the Complete Reference, Schildt Herbert, 4th edition, McGraw Hill

R2. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F.Gilberg,CengageLearningIndia

R3.The‘C’programminglanguage,BrianKernighan,DennisRitchie,PHI R4. Programming in C ,A Practical Approach, Ajay Mittal , Pearson

R5.ProgrammingwithC,B.Gottfried,3rdedition,Schaum’soutlineSeries,TataMcGraw Hill.

R6.ProgramminginANSIC,E.Balagurusamy,7thEdition,McGrawHill.

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE**
**KHADKI, PUNE-03**

**(Autonomous)**

**F.Y.B.Sc. (Computer Science) - Sem –II**

**Code: UCS2CMP1**

**Course Title: :Lab Course Based on UCS2CMT1**
**Advanced C Programming**

| TeachingScheme | No.ofCredits | ExaminationScheme IE |
|---|---|---|
| 04 Hrs/ week | 2 | : 20 marks<br>UE: 30marks |

**Prerequisites**

- ProblemSolvingofmathematicaloperatorandfunctionandarray.
- Basicknowledgeof'C'language.

**Course Objectives**

- Tostudyadvancedconceptsofprogrammingusingthe'C'language.
- Tounderstandcodeorganizationwithcomplexdatatypesandprogrammingstructures.
- Toworkwithfilesanditstypes.

**Course Outcomes**

Oncompletionofthecourse,studentwillbeableto:

- Developmodularprogramsusingfunction,pointers,arrays,stringsandstructures
- DesignanddevelopsolutionstorealworldproblemsusingAdvancedCprogramming.

**Guidelines:**

**LabBook:The lab book is to be used as a hands-on resource, reference and record of assignment submission and completion by the student. The lab book contains the set of assignments which the student must complete as a part of this course.**

**Submission:**

**Advanced 'C' Programming Assignments:**

**The problem solving assignments are to be submitted by thestudentintheformofajournal containing individual assignment sheets. Each assignment includes the Assignment Title, Problem statement, Date of submission, Assessment date, Assessment grade and instructors sign.**

**Programming Assignments:**

**Programs should be done individually by the student in the respective login. The codes should be uploaded on either the local server, Moodle, Github or any open source LMS. Print-outs of the programs and output may be taken but not mandatory for assessment.**

**Assessment:**

**Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes and good programming practices.**

**Operating Environment:**
**ForAdvanced‘C’Programming: Operating system: Linux**
**Editor: Any linux based editor like vi, gedit etc.**
**Compiler: cc or gcc**

**LAB Course Contents**
**Advance C Programming**

| | |
|---|---|
| **Assignment 1** | **Pointers:Operationsonpointers** |
| ● Pointers-Declaration, | |
| ● Definition ,initialization<br>● dereferencing<br>● Pointerarithmetic. | |
| **Assignment 2** | **Pointers:Pointersandarrays** |
| ● Pointertoarray,<br>● Arrayofpointers<br>● Pointertopointer | |
| **Assignment 3** | **Pointers:pointersandfunctions** |
| ● Passingpointertofunction,<br>● Returningpointerfromfunction,<br>● Functionpointer | |
| **Assignment 4** | **Pointers:DynamicMemoryallocation** |
| Dynamicmemorymanagement(Allocation)<br>● malloc(),<br>● calloc(),<br>● Resizing(realloc()), | |
| **Assignment 5** | **Pointers:danglingpointersandfree** |
| ● Releasing(free ())<br>● Danglingpointers | |
| **Assignment 6** | **Strings:basicoperations** |
| ● StringLiterals,stringvariables,declaration,definition,initializationandSyntaxanduseof Predefinedstringfunctions | |
| **Assignment 7** | **Strings:arrayofstrings&pointers** |
| ● ArrayofstringsandPointers | |
| **Assignment 8** | **Structures:Basics** |
| ● Structure,definitionandinitialization,useoftypedef.<br>● AccessingstructurembersandNestedStructures | |
| **Assignment 9** | ArraysofStructuresandfunctions |

- ArraysofStructuresandfunctions-Passingeachmemberofstructureasaseparate argument,
- Passingstructurebyvalue/address.

| **Assignment 10** | PointersandStructures |
|---|---|

UseofPointersandStructures

| **Assignment 11** | **Unions** |
|---|---|

ConceptofUnion,declaration,definition,accessingunionmembers

| **Assignment 12** | **Command line arguments : basics** |
|---|---|

- Toaccesscommand-linearguments
- Functions -atoi(), atol() and atof()

| **Assignment 13** | **Command line arguments: use of files** |
|---|---|

- Arithmetic operation on arguments
- Accessing string and file using command line arguments

| **Assignment 14** | **FileHandling** |
|---|---|

- StreamsandTypesoffiles.
- Operationsontextfiles.
- StandardlibraryinputoutputfunctionsandRandomaccesstofiles.

| **Assignment 15** | **Preprocessor** |
|---|---|

- PreprocessorandFormatofpreprocessordirective
- Fileinclusiondirectives(#include)
- Macrosubstitutiondirective,argumentedandnestedmacroandmacrosversusfunctions

**ReferenceBooks:**

R1. C: the Complete Reference, Schildt Herbert, 4th edition, McGraw Hill
R2. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F.Gilberg,CengageLearningIndia
R3.The‘C’programminglanguage,BrianKernighan,DennisRitchie,PHI R4. Programming in C ,A Practical Approach, Ajay Mittal , Pearson
R5.ProgrammingwithC,B.Gottfried,3rdedition,Schaum’soutlineSeries,TataMcGraw Hill.
R6.ProgramminginANSIC,E.Balagurusamy,7thEdition,McGrawHill.

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE KHADKI, PUNE-03**

## (Autonomous)

**F.Y.B.Sc. (Computer Science) - Sem –II**

**Course Type: Subject 2** **Code:** UCS2 MTT1

**Course Title :Graph Theory**

| TeachingScheme | No.ofCredits 2 | ExaminationScheme |
|---|---|---|
| 02 Hrs/ week | | IE : 20 marks<br>UE: 30marks |

Aims :

- To give the students a sufficient knowledge fundamental principles ,methods and a clear perceptionofinnumerouspowerofmathematicalideasandtoolsandknowhowtousethem by modeling , solving and interpreting.
- Reflectingthebroadnatureofthesubjectanddevelopingmathematicaltoolsforcontinuing further study in various fields of science.
- Enhancingstudents' overall developmentandtoequipthemwithmathematicalmodeling abilities, problem solving skills,
- Creative talent and power of communication necessary for variouskinds of employment.
- Enablingstudentstodevelopapositiveattitudetowardsmathematicsasaninterestingand valuable subject of study
- Totest,debugandexecuteprograms.

**Course Objectives**

- Astudentshouldbeabletorecallbasicfactsaboutmathematicsandshouldbeabletodisplayknowledge of conventions such as notations , terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies.
- Astudentshouldgetarelationalunderstandingofmathematicalconceptsandconcernedstructures, and should be able to follow the patterns involved, mathematical reasoning .
- Astudentshouldgetadequateexposuretoglobalandlocalconcernsthatexplorethemmany aspects of Mathematical

**Course Outcomes**

Upon successful completion of this course, the student will be able to:

- Workwithgraphsandidentifycertainparametersandpropertiesofthegivengraphs.
- Performcertainalgorithms,justifywhythesealgorithmswork,andgivesomeestimatesofthe running times of these algorithms.
- Solvebasicexercisesofthetype:givenagraphwithpropertiesX,provethatthegraphalso has property Y.
- Developan appreciation for the literature on the subject and be able to read and present results from the literature.
- Writecohesiveandcomprehensivesolutionstoexercisesandbeabletodefendtheir arguments.

Course Contents

| | | |
|---|---|---|
| **Chapter 1** | **AnIntroductiontograph** | **8 Hrs** |

Definitions, Basic terminologies and properties of graph.
Special types of graphs, some applications of special types of graph.
Matrix representation and elementary results, Isomorphism of graphs.

| **Chapter 2** | **Connected graph** | **7 Hrs** |
|---|---|---|

Walk,trail,path,cycle,moredefinitionsandelementarypropertiesof connectedness.
Cutedge(Bridge),Cutvertex,cutset,vertexconnectivity,edgeconnectivity,definitionsand properties.
Shortest pathproblem,Dijkstra'salgorithm.

| **Chapter 3** | **Euler and Hamilton path** | **7Hrs** |
|---|---|---|

TheKonigsbergbridgeproblem,Eulertrail,path,circuitandtour,elementarypro perties and examples, Fleury's algorithm
Hamilton path, circuit, definitions, elementary properties and examples

| **Chapter 4** | **Trees** | **8 Hrs** |
|---|---|---|

Definitions, basic terminologies, properties and applications of trees.
Weightedgraph,definitionandpropertiesofspanningtree,shortestspanningtree, Kruskal's algorithm, Prim's algorithm.
Binarytree,definitionsandproperties,treetraversal:preorder,inorder,postorder,inf ix,prefix, postfix notations and examples.

Books:

**TextBook:**

KennethRosen,DiscreteMathematicsanditsapplications.SeventhEdition(TataMcGraw Hill).

**ReferenceBooks:**


1. JohnClarkandDerekHolton,AfirstlookatGraphtheory,(AlliedPublishers)
2. NarsinghDeo,GraphTheorywithapplicationstocomputerscienceandengineering.(Prentice Hall)
3. C.L.Liu,ElementsofDiscreteMathematics,(TataMcGrawHill)
4. DouglasB.West,IntroductiontoGraphTheory,secondedition.(PearsonEducation)


**Savitribai Phule Pune University**
**F.Y.B.Sc.(ComputerScience)-Sem–II**
**Course Type: Subject 2 Code:UCS2MTP1**
**Course Title :Mathematics Practical II**

| Teaching Scheme | No. of Credits | Examination Scheme |
|---|---|---|
| 4 Hrs /Week | 2 | IE:20 Marks<br>UE: 30 Marks |
| **Assignment 1** | **Using networkx from python do the following** | |

1. Generate graph G with vertex(node) set {1,2,3,4,5}and the edge set{(1,5),(1,3),(1,2),(2,3),(2,4), (3,4), (4,5)} . Draw graph G.

2. Generate graph G1 with vertex set {'a','b','c','d'} and the edge set{x=('a','d'), y=('b','c'), z=('b',''d'), w=('a','c')}. Draw graph G1 showing labeled vertices and edges.

3. Generate graph G2 with vertex set {1,2,3,4,5} and edge set {(4,5),(5,3), (2,2),(2,3),(2,4),(3,4), (1,5)} . Draw graph G2 with vertices in red colour and edges in green.

4. Find the number of vertices, number of edges and degrees of all vertices in above graphs.

5. Verify Handshaking lemma for above graphs.

| **Assignment 2** | **Using network from python do the following** |
|---|---|

1. Draw a regular graph on 4 vertices with degree2.
2. Draw a regular graph on 5 vertices with degree3.
3. Draw the star graphs on 4, 7 and8 vertices
4. Draw the Petersen graph. Determine whether G is 2_regular. Is it 3_regular graph?
5. Find adjacency matrix and incidence matrix of each of above graphs. Find the number of vertices, number of edges and degrees of all vertices in above graphs

| **Assignment 3** | **Using network from python do the following** |
|---|---|

1. Draw the null graphs different number of vertices for example $N_7$, $N_{17}$, $N_{12}$ etc.
2. Draw the complete graphs for example $K_5$, $K_{30}$, $K_{45}$etc.
3. Draw the cycle graphs such as $C_8$, $C_{12}$, $C_{20}$, $C_{35}$etc.
4. Draw the wheel graphs for such as $W_5$, $W_{10}$, $W_{21}$, $W_{30}$.
5. Draw the complete bipartite graphs $K_{4,3}$, $K_{1,8}$, $K_{5,9}$ etc.

| **Assignment 4** | **Using network from python do the following** |
|---|---|

1. Draw a directed graph D1 with vertex set V={1,2,3,4,5} and directed edge set E = {(1,4) ,(2,3), (1,2), (5,3), (5,1), (4,1), (3,2),(5,2), (5,4)}. Draw underlying Graph of D1, Find in degrees and out degrees of all vertices in D1.
2. Draw a directed graph D2 with vertex set V= {1, 2, 3, 4 } and directed edge set

i. {(2,4),(2,3),(1,3),(4,1),(3,2),(1,2)}. Draw underlying graph of D2, Find in degrees and out degrees of all vertices in D2.

3. Draw any symmetric directed graph on given number of vertices.
4. Draw any asymmetric directed graph on given number of vertices.
5. Draw any complete symmetric directed graph on given number of vertices.
6. Draw any complete asymmetric directed graph on given number of vertices.

| **Assignment 5** | **Using network from python do the following** |
|---|---|

| | |
|---|---|
| **1.** Create a simple graph G. Draw graph G with nodes and edges in colors of your choice.<br>2. Create and draw complement of above G. Determine whether the complementis simple graph.<br>3. Determine whether G is bipartite.<br>4. Find the number of components in the graph G.<br>*5.* Determine whether G is connected. Determine whether the complement of G is connected. | |
| **Assignment 6** | **Using network from python do the following** |
| 1. Draw K= Complete graph $K_5$, H= complement of $N_5$. Determine whether K is isomorphic to H.<br>2. Generate and draw any 2 graphs with names G1 and G2. Determine whether G1 is isomorphic to G2.<br>3. Draw union of graphs G1 and G2.<br>4. Draw intersection of graphs G1 and G2.<br>5. Draw product of graphs G1 and G2. | |
| **Assignment 7** | **Using network frompythondothe following** |
| 1. Draw any graph G.<br>2. In the graph G add some vertices and add some edges.<br>3. From the graph G delete some vertices and delete some edges.<br>4. Determine whether G is connected graph.<br>5. Find the vertex connectivity and edge connectivity of the graph G. | |
| **Assignment 8** | **Using network from python do the following** |
| 1. Draw any connected graph G.<br>2. Find all bridges, allcut vertices (articulation points) and cut set in G.<br>3. Find the vertex connectivity and edge connectivity of G.<br>4. Find the eccentricity of every vertex in G.<br>5. Find center, radius and diameter of graph G. | |
| **Assignment 9** | **Using network from python do the following** |
| 1. Draw any connected graph G.<br>2. Find all pathsin G and all trailsin G.<br>3. Draw paths of some given lengths from G.<br>4. Find all cycles in graph G. Is it Hamiltonian graph?<br>5. Determine whether G is Eulerian graph,whether itis Semi Eulerian graph. | |
| **Assignment 10** | **Using network from python do the following** |
| 1. Draw any connected graph G. Determine whether G is a tree.<br>2. Draw spanning tree T in G.<br>3. Find the number of vertices in spanning tree of G.<br>4. Find the number of edges in spanning tree of G.<br>5. Determine whether spanning tree T of G is a binary tree. | |

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE KHADKI, PUNE-03**

## (Autonomous)

**F.Y.B.Sc. (Computer Science)- Sem–II**

**Course Type: Subject 3 Code:UCS2 ELT1**

**Course Title : Principles of Digital Electronics**

| Teaching Scheme | No. of Credits | Examination Scheme |
|---|---|---|
| 02 Hrs/ week | 2 | IE : 20 marks<br>UE: 30 marks |

**Course Objectives**

- **To learn different number system and their interconversion.**
- **To understand logic gates and their applications.**
- **To study rules and laws of Boolean algebra.**
- **To understand design of combinational circuit and their different types.**

**Course Outcomes**

- **1. To learn different number system and their interconversion.**
- **2. To understand logic gates and their applications.**
- **3. To study rules and laws of Boolean algebra.**
- **4. To understand design of combinational circuit and their different types..**

**Course Contents**

| | | |
|---|---|---|
| **Chapter 1** | **Number Systems and Digital Codes** | **07 Hrs** |

Introduction to decimal, binary, octal and hexadecimal number system and their inter-conversions, the concept of 1's and 2's complements, binary addition, binary subtraction using 1's and 2's complements. BCD code, Excess-3 code, Gray code and ASCII code.

| | | |
|---|---|---|
| **Chapter 2** | **Logic Gates** | **03 Hrs** |

Logic gates–basic and derived (symbol, Boolean equation and truth table), concept of Universal gates.

| | | |
|---|---|---|
| **Chapter 3** | **Logic Families** | **04Hrs** |

Introduction of CMOS and TTL logic families. Parameters of logic families: voltage levels, propagation delay, noise margin, fan in, fan out, power dissipation Comparison between CMOS and TTL logic families.

| | | |
|---|---|---|
| **Chapter 4** | **Boolean Algebra** | **05 Hrs** |

Laws of Boolean Algebra, De-Morgan's theorems, simplification of logic equations using Boolean algebra, minterms, maxterms, Boolean expression in SOP and POS form, conversion Of SOP/POS expression to its standard SOP/POS form.

| | | |
|---|---|---|
| **Chapter 5** | **Introduction to Karnaugh Map** | **05 Hrs** |

Introduction to Karnaugh map, problems based on SOP (upto4 variables), digital designing using K-map for 3-bit gray to binary and binary to gray conversion. Ex-OR gate as a 4-bit Parity Checker and Generator.

| | | |
|---|---|---|
| **Chapter 6** | **Combinational Circuits** | **05 Hrs** |

Introduction to Arithmetic Circuits, half adder, full adder, half subtractor, full subtractor, four-bit parallel adder, universal adder / subtractor, digital comparator, introduction to ALU. Introduction. Encoders: decimal to BCD/ binary, 3x4 matrix keyboard encoder and priority encoder. Decoders: BCD to decimal and BCD to seven segment decoder.

**Reference Books:**


1. Digital Design - M. Morris Mano, PHI, New Delhi.
2. Digital Systems Principles and Applications - Ronald J. Tocci.
3. Digital electronics - G. K. Kharate, Oxford University Press.
4. Fundamentals of Digital Circuits - Anand Kumar.


**F.Y.B.Sc. (Computer Science)- Sem–II**
**Course Type: Subject 3 Code: UCS2 ELP1**
**Course Title : Electronics Practical Course II**

| Teaching Scheme | No. of Credits | Examination Scheme |
|---|---|---|
| 04 Hrs/ week | 2 | IE : 20 marks<br>UE: 30 marks |

**Course Objectives**

- To understand logic gates ICs and their applications in Digital Design.
- To design different digital circuits using logic gates.
- To study different combinational circuits.

**Course Outcomes**

- Understand the design and build of digital circuits using logic gates.
- Use breadboard / tag-board for building small electronic circuits.
- Design digital circuits for different applications.
- Validate observed outputs with expected theoretical outputs.

Course Contents

**Group A**

| | |
|---|---|
| 1 | Verification of logic gates by using digital ICs. |
| 2 | Verification of De Morgan's theorems. |
| 3 | Study of half adder and full adder using logic gates. |
| 4 | Study of half subtractor and full subtractor using logic gates. |
| 5 | 3-bit binary to Gray conversion using logic gates. |
| 6 | 3-bit Gray to Binary conversion using logic gates. |
| 7 | Study of EX-OR gate as a 4-bit parity generator. |
| 8 | Study of EX-OR gate as a 4-bit parity checker. |
| 9 | Study of BCD to seven segment decoder using IC 7447 |
| 10 | Study of Decimal to BCD/Binary encoder. |

**Group B: Activity (Any1: Equivalent to 2 Practical's)**

1. Perform any 2 experiments from Group A using circuit simulation software LTSPICE / Circuit Mod / Proteus etc. (Give preference to not performed experiments)

2. Perform survey of following topics –

   a. Study of laboratory safety and precautionary measures.

   b. Study of e-waste management or any relevant topic of Electronics.

**Suggested Readings/Material:**


1. Digital Design - M. Morris Mano, PHI, New Delhi.
2. Digital Systems Principles and Applications - Ronald J. Tocci.
3. Digital electronics - G. K. Kharate, Oxford University Press.
4. Fundamentals of Digital Circuits - Anand Kumar.
5. Digital Principles and Applications - Malvino and Leach, TMG Hill Edition.

**TIKARAM JAGANNATH ARTS COMMERCE AND SCIENCE COLLEGE KHADKI, PUNE-03**

## (Autonomous)

**F.Y.B.Sc. (Computer Science)-Sem–II Course**

**Type: SEC Code : UCS2SECSTP**

**Course Title: Statistical Methods for Computer Science II**

| Teaching Scheme | No. of Credits | Examination Scheme |
|---|---|---|
| 04 Hrs/ week | 2 | IE : 20 marks<br>UE: 30 marks |

**Prerequisites**

- Basic knowledge of Computer concepts is assumed.
- Basic Concepts of statistics is assumed.

**Course Outcomes**

On completion of the course, student will be able to :

- Fit second-degree curve, and exponential curves.
- Estimate trends by using time series data.
- Understand concept of probability.
- Estimate probabilities of standard probability distributions
- Perform tests based on normal, Chi-Square, t and F distributions.

List of experiments

| Sr.No. | Title of the Experiment | No. of Experiments |
|---|---|---|
| 1 | Fitting of second-degree curve $Y=a+bX+cX^2$ using MS-Excel.<br>(Use of scatter plot for explaining then on linear relationship between two variables) | 1 |
| 2 | Fitting of exponential curve of type $Y=ab^x$, $Y=aX^b$ using MS-Excel.<br>(Use of scatter plot for explaining the nonlinear relationship between two variables) | 1 |
| 3 | Time Series-Estimation of trend by using the method of moving averages by using regular formula method and by using MS-Excel. | 1 |
| 4 | Time Series-Estimation of trend by using exponential smoothing by regular formula and by using MS-Excel. | 1 |
| 5 | Problems on probability theory (P(A∪B), P(A'∪B'), P(A'∩B), P(A'∩B')Use Venn diagram when ever possible. | 1 |
| 6 | Computation of probability values for Normal distribution and Chi-square distribution using MS Excel command. | 1 |
| 7 | Computation of probability values for t distribution and F distribution using MS Excel command. | 1 |
| 8 | Test for means and proportion (Z-test)<br>i) $H_0:\mu=\mu_0$ vs $H_1:\mu\neq/>/<\mu_0,\sigma^2$ known<br>ii) $H_0:\mu_1=\mu_2$ vs $H_1:\mu_1\neq/>/<\mu_2,\sigma^2$ known<br>iii) $H_0: P = P_0$ vs $H_1: P \neq / > / < P_0$<br>iv) $H_0:P_1=P_2$vs $H_1:P_1\neq/>/<P_2$ | 1 |
| 9 | Test based on students t<br>i) $H_0:\mu=\mu_0$vs$H_1:\mu\neq/>/<\mu_0$, $\sigma^2$ unknown<br>ii) $H_0:\mu_1=\mu_2$vs$H_1:\mu_1\neq/>/<\mu_2,\sigma^2$ unknown<br>iii) Paired t-test | 1 |
| 10 | Test based on $\chi^2$<br>i) Goodness of fit<br>ii) Independence of attributes (2x 2).<br>iii) Independence of attributes (2x3or3x2or3x3) | 1 |

| | | |
|---|---|---|
| 11 | Tests based on F-distribution<br>i) $H_0:\sigma_1^2 = \sigma_2^2$ vs $H:\sigma_1^2 \neq />/ <\sigma_2^2$, means known<br>ii) $H_0:\sigma_1^2 = \sigma_2^2$ vs $H:\sigma_1^2 \neq />/<\sigma_2^2$, means unknown | 1 |
| 12 | Project- Data collection and Analysis of the data . | 1 |

Note:

i) Every practical is equivalent to four theory lectures per batch per week

ii) One hour is reservedfortheoryexplanationofcorrespondingpractical.

iii) Forproject,agroupofmaximum8 studentsbemade.Allthestudentsinagrouparegivenequalmarksforproject.Differentdatasets from primary or secondary sources may be collected.